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Social media utilization level among South African smallholder farmers: a case study of Mopani District, Limpopo Province

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ABSTRACT

This study assessed the use of social media among smallholder farmers using the Mopani district, Limpopo, in South Africa, as a case study. A structured questionnaire was used to obtain information from 383 randomly sampled smallholder farmers in the study area. Data were analyzed with SPSS version 28 and STATA version 14 using descriptive statistics and multiple linear regression analysis. The findings revealed that most farmers had positive perceptions of the benefits and ease of using social media platforms. However, the usage of social media platforms is still low, especially for agricultural purposes, as most farmers are yet to leverage the potential benefits of using social media for marketing, advertising and facilitating linkages with extension agents and other agricultural institutions. The multiple linear regression model revealed that farmers' age, educational qualification, frequency of visits to other locations, perceived benefit index, constraint index and secondary occupation were significant factors influencing the usage of social media in the study area. The study recommends that the government should facilitate social media platforms' cost subsidization policies to promote inclusive technology for smallholder farmers. In addition, extension organizations and other rural advisory service stakeholders should package capacity-building programs to educate farmers on maximizing the benefits of social media platforms for agricultural purposes. This will greatly improve their access to vital and timely information, resources, and linkage with extension agencies, and expand opportunities for marketing their farm produce to more profitable outlets beyond the farm gate.

NOVELTY STATEMENT

The authors confirm that this research and the content of this manuscript have not been submitted to any other journal outlet for publication. However, prior to the final development of the expanded version of this manuscript, a 2-page abstract containing a summary of findings from this study was submitted for a conference presentation at the Association for International Agricultural and Extension Education 2023 conference in Guelph, Canada. This conference presentation allowed for a wide range of constructive research comments and criticisms, which ultimately contributed to improving the content of this full and expanded manuscript. This 2-page abstract that was submitted has been published as a conference abstract proceeding and contains a few similar statements that have been elaborated upon in this full manuscript. The published conference abstract proceeding is available online at: <https://aiaee.org/resources/Documents/2023%20AIAEE%20Conference%20Proceedings%20Final.pdf>

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Introduction

Globally, social media applications are regarded as the powerhouse of communication and the main channel for mass marketing and broadcasting (Suchiradipta & Saravanan, 2016). Social media offers major opportunities that have the power to allow millions of farmers to gain access to the same information without being prevented by geographical discrepancy and other localized constraints (Cornelisse et al., 2011). These applications are also gaining increased use for agricultural knowledge and information brokerage. Farmers worldwide use social media because of their convenience, instant feedback, and capability to connect with farmers, extensionists, agricultural specialists, agribusinesses and consumers across different geographical areas (Singh, 2019). Social media apps have thus offered new opportunities to farmers, extension organizations, policymakers and administrators. It has the potential to create equality in terms of accessibility to information and agricultural technologies, and it continues to generate wide societal acceptance even among farmers all around the world (Chisenga, Kedemi & Sam, 2014).

In South Africa, several agricultural institutions, including the Department of Agriculture Land Reform and Rural Development, Agricultural Research Council and the Agricultural Sector Education Training Authority, have incorporated social sites, such as Instagram, LinkedIn, Facebook, WhatsApp as part of their information system, a platform to share links, news updates, and farmer/consumer inquiries and feedback (Kipkurgat et al., 2016). However, despite the available potential and myriad of benefits that the use of social media apps has to offer, coupled with the efforts of private and public organizations to connect with farmers through social media, many farmers in South Africa, especially in rural areas, do not seem to fully leverage the potential derived from their use. Research has reported a low level of social media responsiveness and usage in rural communities in developing countries (Suchiradipta & Saravanan, 2016). As opined by Aguera et al. (2020), this lag behind smallholder farmers in the use of social media in developing countries (including South Africa), in a world moving towards digitalized agriculture will further reduce their relevance and competitiveness in the agricultural space.

Moreso, the current trends and issues in South Africa's agricultural system ranging from limited number of extension personnel to growing numbers of smallholder farmers and the advent of the Covid-19 pandemic has brought to the fore the need for smallholder farmers in South Africa to leverage more on the use of information and communication technology (ICT) tools, applications and digitalized agriculture for sustainable agricultural development. According to Accenture (2018), the intensification of digital agri-technology usage among farmers for information access, information sharing, and facilitating linkages with stakeholders in the agricultural industry can facilitate great value for South Africa between now and 2026.

A critical review of the literature reveals that empirical research on social media usage among smallholder farmers has been conducted in Kenya (Wangu, 2014; Kimani et al., 2019), on the usage of mobile technology by commercial farmers in South Africa (Simpson & Calitz, 2014), and on mobile phone adoption drivers for marketing by smallholder farmers in South Africa (Sikundla et al., 2018). However, there is a dearth of research on social media usage among smallholder farmers, especially in the Limpopo province of South Africa, which is one of the main hub of the country where smallholder farmers are important drivers in the economy of the area (Maponya & Mpandeli, 2012). Therefore, as a response to the dearth of empirical research on social media usage among smallholder farmers in South Africa, it is pertinent to evaluate the current social media use status of these farmers. This was achieved by answering the following research question:

1. What is the level and purpose of social media platforms usage among smallholder farmers in the area?
2. What are the smallholder farmers perceived benefits of using social media?
3. What is the perceived ease of using social media amongst smallholder farmers?
4. What are the challenges experienced by smallholder farmers in their use of social media?
5. What are the socio-economic factors influencing the usage of social media among smallholder farmers in the study area?

The purpose of this study was to assess the level of social media usage among smallholder farmers in South Africa using Limpopo province, a major agricultural hub in the country where smallholder

farmers are important drivers in the economy, as a case study. Specifically, the objectives of the study are as follows:

1. assessed the usage of social media platforms among smallholder farmers;
2. determined the smallholder farmers perceived benefits of using social;
3. examined the perceived ease of using social media among smallholder farmers;
4. identify the challenges experienced by the farmers in their use of social media;
5. determine the factors influencing the usage of social media by smallholder farmers in the study area.

The findings from this study are geared towards bridging the gap in the limited research studies that have investigated the usage of social media among farmers in Africa. The study provides unique information on smallholder farmers' social media utilization level and the potential for its use to enhance farmers' personal and agricultural undertakings. This provides adequate and informed insight for the government and other stakeholders in the agricultural information system on strategies to embark on upscaling ICT and social media use in agriculture for sustained agricultural development and food security in the country. The new location-specific knowledge generated by this research serves as a good pedestal for supporting and capacitating smallholder farmers on social media usage in agriculture to complement the traditional information networking, sourcing, sharing and marketing strategies employed by farmers and rural advisors in the area. In addition, Aguera et al. (2020) pointed out that social media is a tool that will usher farmers in the future of digitalized agricultural extension and information systems globally. Thus, recommendations made from the findings of this study are to assist agricultural knowledge and information system stakeholders on how to harness the convenience and potential of social media platforms to improve the livelihoods of farmers.

Literature review and theoretical framework

In this study, the technology acceptance model (TAM) was reviewed in relation to the synthesis of literature to elucidate the utilization of social media platforms and applications among smallholder farmers. The TAM, which is an extension of the theory of reasoned action, points out how various external variables such as smallholder farmers' socioeconomic characteristics, constraints and so on, are capable of influencing individuals' perception and intention to utilize an innovation, which in this study are the various social media platforms (Venkatesh & Bala, 2008). The model establishes that an individual's intention is usually affected by their perceived benefits and ease of use of such technologies (Davis, 1989). Extensive research has been conducted on these two variables over the years, facilitated by the theory of reasoned actions, whereby a person's choice to adopt or reject is largely dependent on the benefit and ease of use of the innovation (Saadé, 2007; Malhotra et al., 2001; Venkatesh & Bala, 2008). According to Fathema et al. (2015), the individual perceived benefits and ease of using a technology are key influencers of users' acceptance and utilization.

As shown in Figure 1, this study adopts the TAM as the foundation for evaluating how smallholder farmers' perceptions of the benefits and ease of using social platforms affect their behavioral intent to use social media applications in their agricultural undertakings. Venkatesh and Davis (2000) identified TAM as the most influential framework in academic research on the adoption and usage of information- and communication-related technologies. Furthermore, Legris et al. (2003) stated that the TAM is a suitable theoretical model of choice for describing the behavior of ICT users. TAM assumes perceived benefit and ease of usage as the core cognitive principles that define an individual's attitude to use an innovation, ultimately prompting one's intention to adopt. Perceived benefit/usefulness (image, job relevancy, output quality, subjective norm, etc.) and perceived ease of use (technology self-efficiency, perceived enjoyment, etc.) are regarded as independent variables influencing behavior. TAM relates to this study in that it puts into perspective the nomological network of significant aspects influencing farmers' views of the benefit and ease of using social media platforms. It also shows the relationship between perceived ease of use and perceived benefit, which denotes that a farmer's perceived ease of using social media is also considered alongside the perceived benefit of using it.

However, perceived benefit does not necessarily imply perceived ease of use. According to Aguera et al. (2020), the following were found to be key elements of perceived benefit and ease influencing the

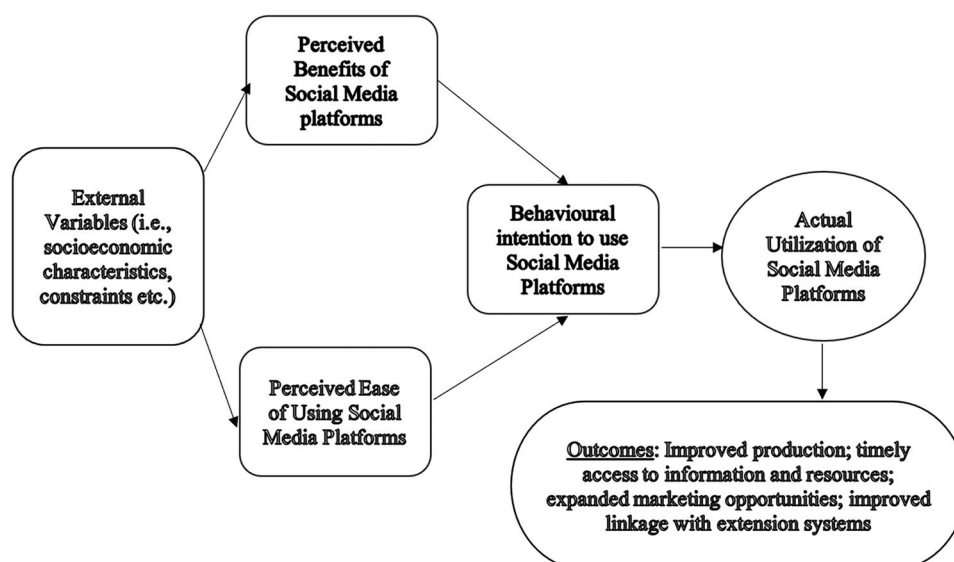


Figure 1. Technology acceptance model for social media utilization.

Source: Adapted from Venkatesh and Bala (2008).

use of social media in agricultural activities among farmers across different geographical studies: time conserving, messaging, broader coverage, access to information, cheap and easily accessible, ability to network online, agribusiness marketability and interaction with extension agents and prospective business opportunities. In addition, Kimani et al. (2019) also stated that the perception of ease of use consists of four factors: effort and skills, ease of understanding and learning, cumbersomeness and satisfaction, which are important features that enable farmers to use social media applications. Figure 1 reveals that both perceived benefit and ease of using social media are independent variables that influence farmers' behavioral intent to use social media platforms in their agricultural enterprise. Once the behavioral intent of a farmer is to accept the use of social platforms in their agricultural enterprise, such decisions will result in farmers having access to information, saving time and travel costs, having access to markets, and the ability to network with various stakeholders online (Suchiradipta & Saravanan, 2016). Hence, the consistent use of technological initiatives such as social media will ultimately result in increased farm productivity, improved food security, timely access to information and resources, increased adoption of other agricultural innovations and improved linkages between extension and rural advisory services and systems.

Methodology

Study area

The study was conducted in Mopani District, Limpopo Province, South Africa. The district is known as Mopani because of the profusion of the nutritious Mopani worms found in the area. Mopani District has incredible tourist attractions and landmarks. It is situated in the north-eastern region of the province. The Mopani district has an area size of 20,011 km², which includes a part of the Kruger National Park to the Shingwedzi rivers. The surrounding vegetation in the district was Savannah and Grassland. The highest amount (85%) of rain in the district was received in the summer. Rainfall differs from the high-slope areas (2000 mm/a) to the dry savannah areas (400 mm/a). The temperature ranges from a maximum average of 21°C in hilly areas to 40°C in dry Lowveld areas (Dubb, 2016). The agricultural industry is one of the largest in Mopani, and it is a significant part of the economic development of the area. This district is known to produce citrus, mangoes, avocados and bananas. It is also the largest producer of tomatoes in South Africa (Statistics South Africa, 2016). The study was carried out in the Mopani district of Limpopo Province because it is an area with many smallholder farmers categorized under both intensive and extensive farming in the province (Ubisi, 2016).

Sampling

This study employed a quantitative approach utilizing a descriptive survey research design. According to Saunders et al. (2012), a quantitative descriptive research method is aimed at researching a large sample size of the population, mainly focusing on the quantity of responses to allow for generalization and data are ultimately analyzed statistically to draw conclusions. This study adopted this research design following the precedence of Masephula and Olorunfemi (2023), Nyawo and Olorunfemi (2023) and Abegunde et al. (2019), who used a similar research design in their recent related studies. The selection of respondents in the district was carried out using a simple random sampling procedure, which is a probability sampling that provides a fair opportunity to all registered smallholder farmers in the district to participate in the study. There are approximately 5000 registered smallholder farmers in the district (Limpopo Department of Agriculture and Rural Development (LDARD), 2022). The list of registered smallholder farmers obtained from the database was used as a sampling frame to select respondents for the study. The Raosoft sample size calculator, which automatically helps to generate the required sample size from a known population using a 95% confidence level and a 5% margin of error, was employed to determine the required sample size for the study. Computation from the sample size calculator revealed that a minimum sample size of 357 farmers would be appropriate for the study. However, the researcher extended the sample size to 383 registered smallholder farmers to increase the reliability and generalizability of the study. Thus, a sample of 383 farmers participated in the study.

Data collection and analysis

Information was acquired from the respondents using a structured questionnaire that was administered and filled out by trained enumerators during interviews with farmers. The questionnaire was structured and divided into sections based on the objectives of the study. The first section was used to capture information on farmers' socioeconomic characteristics. Data such as age, education level, gender, farming experience, farm size and farm enterprise were elicited. The second section was used to collect data on the respondents' level and purpose of social media usage. A list of social media apps was presented to the farmers, who were asked to indicate whether they used (1) or not (0) any of these applications. In addition, they were asked to state what they used these platforms. The third and fourth sections of the instrument were used to evaluate respondents' perceptions of the benefits and ease of using social media applications in agricultural undertakings. Respondents were asked to state their perception of some potential beneficial features of social media usage as it relates to their agricultural activities such as time conserving, broader coverage, ease of delivery of products, cheap and easily accessible, ability to network online, agribusiness marketability and interaction with extension agents and other stakeholders. Their agreement or disagreement was measured on a 5-point Likert scale of strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). The actual mean benchmark, based on the rating scale used, was 3. A mean greater than 3 indicates a high and positive perception, while a mean below 3 indicates a low and negative perception level of such benefits by the farmers. A composite perceived benefit index/score was generated using principal component analysis (PCA) for each respondent and was used for further analysis in the regression model. Furthermore, farmers were presented with statements relating to some of the following factors on the ease of social media usage, such as cumbersome, skill-related factors, satisfaction related factors, amount of effort needed to put into use, and so on, and their agreement or disagreement with these statements was measured on a 5-point Likert scale of strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). The actual mean benchmark, based on the rating scale used, was 3. A mean greater than 3 indicates a high and positive perception, while a mean below 3 indicates a low and negative perception of the ease of using social media by the farmers. A composite perceived ease-of-use index/score was generated using PCA for each respondent, which was used for further analysis in the regression model. The fifth section elicited data on the hindrances that farmers face when using social media. The farmers were asked to choose from a list of problems that prevented them from effectively using social media for agricultural-related activities in their area, and this was graded on a three-point severity scale: very severe (3), moderately severe (2) and not severe (1). The actual mean benchmark, based on the rating scale used, was 2. Constraint items

with a mean greater than 2 indicate a severe challenge, whereas items with a mean below 2 are deemed not to be a severe challenge inhibiting farmers' use of social media in the area. A composite constraint index/score was generated using PCA for each respondent and was used for further analysis in the regression model.

The questionnaire was face- and content-validated by experts in the field for relevance and applicability prior to data collection. This allowed for the evaluation of the instrument's arrangement and relevance and checked whether the variables included were reasonable and clear. Furthermore, a reliability assessment of the instrument was also performed during a pre-test to determine the stability and consistency of the instrument for measuring what it is expected to measure. A test-retest method of reliability was employed using ten (10) smallholder farmers from another district not included in the study, and a reliability coefficient of $r = 0.85$ was gotten which is based on available standards in the literature, shows that the questionnaire was reliable (Huck, 2007). SPSS version 28 software (SPSS Inc., Chicago, IL) was used to analyze the elicited data descriptively (frequency counts, percentages, means and ranks). Multiple linear regression analysis using STATA version 14 software (StataCorp, College Station, TX) was employed as an inferential statistic to establish causal relationships between variables to determine the factors influencing the usage of social media among smallholder farmers in the area. The multiple linear regression model was suitable and was well fitted because of its ability to demonstrate the influence of multiple predictor variables presented concurrently to predict the affiliation of one or other variables on a quantitative dependent variable (Tolles & Meurer, 2016).

In the model, a composite utilization score was computed for each respondent, and this individual utilization index was employed as a dependent variable in the multiple linear regression model, while socio-economic characteristics, perceived benefit and ease of use were used as independent explanatory variables. The respondents' social media utilization index was determined by presenting the farmers with a list of social media applications and asking them to indicate their use of these apps for agricultural-related activities on a two-point scale of use (1) and do not use (0). Based on Abegunde et al. (2019), a composite score analysis was used to determine the social media utilization score for each respondent. A composite utilization score was calculated for each farmer from the list of nine social media applications, with a maximum score of 9 obtainable if a farmer used all the social media applications, and a minimum score of 0 if farmers did not use any of the applications. Thus, the generated score was used as a proxy to represent the social media utilization index for each smallholder farmer, which was then fitted as the dependent variable in multiple linear regression analysis.

The multiple linear regression model is presented as follows:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots + \beta_p X_{ip} + \epsilon \quad (1)$$

where Y_i is the dependent variable, in this context the social media utilization score

$X_{i1}, X_{i2}, \dots, X_{ip}$ are the independent variables (which include farmers' socioeconomic characteristics such as age, education, farm size, farming experience and so on; perceived benefit of using social media index; perceived ease of using social media index; and their constraint index). Table 1 reveals a summary description of all the independent variables that was included in the regression model.

β_0 is constant.

β_1 and β_2 are regression coefficients representing the change in Y relative to a one-unit change in X_{i1} and X_{i2} , respectively.

ϵ is the model's random error (residual) term.

Ethical consideration

The study received ethical approval before proceeding with data collection, which was obtained from the University of Mpumalanga Ethics Committee (reference number: UMP/Mulaudzi/MAGric/2021). The study ensured that all participants gave their written informed consent as all participants were made to sign a consent form, and that the principles of voluntary participation, anonymity and confidentiality of respondents, justice, beneficence and non-maleficence were upheld during the data collection process and throughout the implementation of the study.

Table 1. Summary description of the explanatory variables fitted into the regression model.

Variables	Description
Age	Measured in years (continuous)
Education	Measured as 1 for if possession of high formal education ranging from matric and above and 0 if otherwise
Educated family member	Measured as a dummy variable 1 for have educated family member and, 0 if otherwise
Farming experience	Measured in years (continuous)
Farm size	Measured in hectares (continuous)
Membership of farmer group	Measured as a dummy variable 1 for yes and 0 if otherwise
Frequency of visit to other locations	Measured as regularly (2), occasionally (1) and not at all (0)
Perceived benefit index	*PCA generated index
Perceived ease of use index	*PCA generated index
Constraint index	*PCA generated index
Relationship status	Measured as a dummy variable 1 for married and 0 for otherwise
Frequency of extension visit	Measured as regularly (2), occasionally (1) and not at all (0)
Secondary occupation	Measured as a dummy variable 1 for Yes and 0 if otherwise

*Principal component analysis generated an index using the appropriate command in STATA 14 software.

Table 2. Smallholder farmers' socio-economic profile.

Characteristics	Frequency (%)	Mean (SD)
Age (years)		
≤30	6 (1.5)	57.53 (12.47)
31–60	204 (53.3)	
>60	173 (45.2)	
Farming experience (years)		
≤10	273 (71.3)	8.74 (5.62)
11–20	92 (24.0)	
21–30	18 (4.7)	
Farm size (hectares)		
≤2.5 ha	262 (68.4)	2.19 (1.38)
2.6–5.0 ha	114 (29.8)	
≥5.1 ha	7 (1.8)	
Education		
No formal	82 (21.4)	
Primary	103 (26.9)	
Matric	141 (36.8)	
Diploma	34 (8.9)	
Degree	23 (6.0)	
Educated family member		
Have educated family member	368 (96.0)	
Do not have	15 (4.0)	
Membership of farmer group		
Yes	375 (98.0)	
No	8 (2.0)	
Relationship status		
Married	172 (44.9)	
Unmarried	211 (55.1)	
Extension visit		
Not at all	15 (4.0)	
Regularly	15 (4.0)	
Occasionally	353 (92.0)	
Secondary occupation		
Have secondary occupation	111 (29.0)	
Do not have	272 (71.0)	
Frequency of visit to other locations		
Not at all	38 (10.0)	
Regularly	50 (13.0)	
Occasionally	295 (77.0)	

Source: Field Survey, 2022N = 383.

Results

Socio-economic profile of the smallholder farmers

The results in Table 2 show that the mean age of respondents was 57.53 years with a standard deviation of 12.47. In addition, the majority (71.3%) of the respondents indicated that they had 1–10 years of farming experience. The mean years of farming experience in the study area was found to be 8.7 years.

The average farm size among the respondents was found to be 2.19 ha. Furthermore, the results in [Table 2](#) show that the majority (78.6%) of the farmers have one form of formal education or another ranging from primary level to degree, with the majority (96.1%) of the smallholder farmers also indicating the presence of an educated family member in their household. Moreover, the majority (98.0%) of smallholder farmers in the study area were members of farmer groups/cooperative societies. The distribution of farmers according to their relationship status shows that more than half (55.1%) of the smallholder farmers in the study area were single, while the rest (44.9%) were married. The findings in [Table 2](#) further indicate that the majority (92.0%) of the farmers only occasionally received extension visits, and 4% of the population received regular visits. Moreover, the majority (71.0%) of smallholder farmers in the region did not have any secondary occupations. Furthermore, the findings in [Table 2](#) show that the majority (77.0%) of the respondents indicated that they occasionally visited other locations outside their base, while only a few (13.0%) stated that they visited other locations regularly.

Social media utilization among smallholder farmers

The results in [Table 3](#) show that WhatsApp (71.3%) was the social media platform most utilized by smallholder farmers in the area. Other social media platforms were not prominently utilized by farmers in the area, as less than half of the respondents indicated that they used them. However, among these less utilized social media platforms, it is worth mentioning that some of the farmers still explore the usage of Facebook (44.6%) for networking and Twitter (27.2%) for information search.

Purpose of usage of social media platforms

The purpose of social media usage was measured among respondents who indicated that they utilized social media in the study area. [Table 4](#) shows the distribution of respondents based on their social media usage purpose and the tools/apps they used to achieve this purpose. The results indicate that the majority (70.8%) of farmers use social media platforms for personal interest, followed by 69.7% who indicated

Table 3. Distribution of respondents based on their utilization of social media.

Social media platforms	Use	Do not use
WhatsApp	273 (71.3)	110 (28.7)
Twitter	104 (27.2)	279 (72.8)
LinkedIn	44 (11.5)	339 (88.5)
Instagram	52 (13.6)	331 (86.4)
Facebook	171 (44.6)	212 (55.4)
YouTube	59 (15.4)	324 (84.6)
Zoom,	18 (4.7)	365 (95.3)
Snapchat	33 (8.6)	350 (91.4)
Tiktok	57 (14.9)	326 (85.1)

Source: Field Survey, 2022. $N = 383$.

Table 4. Distribution of respondents based on their purpose of usage.

Purpose of usage	Users Freq (%)	Tool used by farmers
Source of agricultural information	264 (68.9)	WhatsApp, YouTube
Connecting/linkage with extension agents	86 (22.5)	WhatsApp, Facebook, LinkedIn, Zoom
Finding news updates and events	153 (39.9)	WhatsApp, Facebook, Twitter, YouTube
Sharing agricultural information	267 (69.7)	WhatsApp, Facebook, Twitter, Instagram, Tiktok
Connecting with other farmers	241 (63.9)	WhatsApp, Facebook, Instagram, LinkedIn
Advertising and marketing of agric. produce	102 (26.6)	WhatsApp, Facebook
Connecting with other clients	241 (62.9)	WhatsApp, Facebook, LinkedIn, Zoom
Other personal interest	271 (70.8)	WhatsApp, Facebook, Twitter, Instagram, Tiktok, YouTube, LinkedIn
Linkage with other agric. related institutions	37 (9.7)	WhatsApp, Facebook, LinkedIn, Zoom
Online purchase of farm-related goods and services	33 (8.6)	WhatsApp
Use for farm financial-related purposes	33 (8.6)	WhatsApp

Variable is a multiple response variable, and values in parentheses represent percentages.

Source: Field Survey, 2022.

using it as a tool for sharing agricultural information, 68.9% who used social media as a source of agricultural information, and 62.9% who used it to connect with clients. However, only a few farmers indicated using social media as a source of news updates and events (39.9%), to connect or link with extension agents (22.5%), to link with agricultural institutions (9.7%), to purchase online farm-related goods and services (8.6%), and for farm financial-related purposes (8.6%).

Perceived benefit of social media utilization

Farmers' perceptions and dispositions regarding the benefits of social media usage were rated on a 5-point Likert-type scale of strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). The actual mean benchmark, based on the rating scale used, was 3. A mean greater than 3 indicates a high and positive perception, while a mean below 3 indicates a low and negative perception level of such benefits by the farmers. The results in Table 5 overwhelmingly show that smallholder farmers in the study area exhibited a high level of perception of the benefits derived from the optimal use of social media platforms by their agreement with the statements, as the mean score of all the statements was above the benchmark of 3. Some of the prominent benefits of social media usage that the farmers agreed with were that it is time conserving (MS = 3.71) and has broader coverage (MS = 3.71), both ranked 1st. Other prominent beneficial statements indicating the high perception of farmers about social media usage in their farm enterprise are the mass reach of a larger number of individuals at the same time (MS = 3.52), ease of delivery of products (MS = 3.37), source of agricultural information (MS = 3.27), allowing for online networking with various stakeholders in the agricultural industry (MS = 3.27) and enhancing agribusiness marketability (MS = 3.27). Furthermore, the farmers attested to the fact that adequate use of social media platforms can improve interaction with extension agents and agencies (MS = 3.25).

Perceived ease of social media utilization

Nine perception statements on the ease of social media usage were presented to the respondents, and their responses were measured on a 5-point Likert scale ranging from strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). The actual mean benchmark, based on the rating scale used, was 3. A mean greater than 3 indicates a high and positive perception, while a mean below 3 indicates a low and negative perception of the ease of using social media by the farmers. The results in

Table 5. Distribution of respondents based on their perceived benefit of using social media.

Potential benefits	Strongly Agree		Neutral Freq (%)	Disagree Freq (%)	Strongly disagree Freq (%)	Mean Score	Rank
	Freq (%)	Agree Freq (%)					
Time conserving	208 (54.3)	44 (11.5)	34 (8.9)	5 (1.3)	92 (24.0)	3.71	First
Broader coverage	207 (54.0)	45 (11.7)	36 (9.4)	4 (1.0)	91 (23.8)	3.71	First
Ease of delivery of products	158 (41.3)	36 (9.4)	78 (20.4)	10 (2.6)	101 (26.4)	3.37	Third
Cheap and easily accessibility	150 (39.2)	28 (7.3)	65 (17.0)	17 (4.4)	124 (32.1)	3.17	Ninth
Source of agricultural information	152 (39.7)	36 (9.4)	70 (18.3)	13 (3.4)	112 (29.2)	3.27	Fifth
Ability to network online with various stakeholders in the agricultural industry	151 (39.4)	37 (9.7)	70 (18.3)	13 (3.4)	112 (29.2)	3.27	Fifth
Enhances Agribusiness marketability	150 (39.2)	38 (9.8)	71 (18.5)	13 (3.4)	111 (29.0)	3.27	Fifth
Improves interaction with extension agents and agencies	151 (39.4)	34 (8.9)	71 (18.5)	12 (3.1)	115 (30.0)	3.25	Eighth
Mass reach of larger number of individuals at the same time	174 (45.5)	45 (11.7)	62 (16.2)	9 (2.3)	93 (24.3)	3.52	Third

The mean scores were derived from strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1). Field Survey, 2022.

Table 6. Distribution of respondents based on their perceived ease of using social media.

Potential ease of use	Strongly agree Freq (%)	Agree Freq (%)	Neutral Freq (%)	Disagree Freq (%)	Strongly disagree Freq (%)	Mean score	Rank
Easy navigation	155 (40.5)	70 (18.3)	48 (12.5)	12 (3.1)	98 (25.6)	3.45	First
Apps and platforms have a clear and comprehensible web page.	153 (39.9)	70 (18.3)	49 (12.8)	13 (3.4)	98 (25.6)	3.44	Second
Easy and convenient to use	153 (39.9)	73 (19.9)	46 (12.0)	13 (3.4)	98 (25.6)	3.44	Second
Does not take long to understand utilization	152 (39.7)	71 (18.5)	49 (12.8)	13 (3.4)	98 (25.6)	3.43	Sixth
Platforms have clear and precise user manual or instructions	153 (39.9)	68 (17.8)	50 (13.1)	14 (3.7)	98 (25.6)	3.43	Sixth
Platforms are beginner friendly.	153 (39.9)	71 (18.5)	49 (12.8)	12 (3.1)	98 (25.6)	3.43	Sixth
Attractive and colorful web pages	153 (39.9)	71 (18.5)	49 (12.8)	12 (3.1)	98 (25.6)	3.44	Second
Does not require a lot of technical expertise	152 (39.7)	71 (18.5)	47 (12.3)	15 (3.9)	98 (25.6)	3.43	Sixth
Does not require a formal education/training to grasp	152 (39.9)	72 (18.8)	48 (12.5)	13 (3.4)	98 (25.5)	3.44	Second

The mean scores were derived from strongly agree (5), agree (4), neutral (3), disagree (2) and strongly disagree (1).

Source: Field Survey, 2022.

Table 6 also overwhelmingly indicate that smallholder farmers in the area have a high level of perception of the ease of using social media platforms by their agreement with the perception statements posed to them, as the mean score of all the statements was above the benchmark of 3. Prominent statements indicating a high level of perception of the ease of using social media as highlighted by the farmers were that social media is easy to navigate (MS = 3.45), easy and convenient to use (MS = 3.44), apps and platforms are clear and comprehensible (MS = 3.44), and do not require much formal training (MS = 3.44) as they ranked first and second, respectively. Furthermore, the results also show that farmers agreed that social media does not take long to understand (MS = 3.43), has a clear and precise user manual or instructions (MS = 3.43), does not require a lot of technical expertise (MS = 3.43) and is beginner-friendly (MS = 3.43).

Challenges of social media utilization

Farmers' responses to the challenges faced in their utilization of social media were measured on a three-point severity scale: very severe (3), moderately severe (2) and not severe (1). The actual mean benchmark, based on the rating scale used, was 2. Constraint items with a mean greater than 2 indicate a severe challenge, whereas items with a mean below 2 are deemed not to be a severe challenge inhibiting farmers' use of social media in the area. Using the mean score to rank the constraints according to their order of severity as indicated by the respondents, the most severe constraints from Table 7 pointed out by the farmers was the 'high cost of tools and connecting devices such as cell phone, laptop, tablet and so on' which was ranked first with mean score of 2.58. Others were 'high cost of maintenance' (MS = 2.50) ranked second, 'high cost of internet facilities and data charges' (MS = 2.48) ranked third, 'inadequate infrastructure to support use' (MS = 2.43) ranked fourth, 'lack of technical skills and capacity to use tools and apps' (MS = 2.38) ranked fifth and 'inadequate exposure and training' (MS = 2.37) ranked sixth. However, smallholder farmers indicated that some of the listed challenges were not severe in the study area, as the mean score of these constraint items was below the benchmark of 2. Some of the constraints that were not severe in the area were 'inadequate authentication and accuracy of provided information and data on social media' (MS = 1.73), 'privacy concerns' (MS = 1.72) and 'poor network coverage and internet connectivity' which was ranked 10th on the list with a mean score of 1.68.

Factors influencing smallholder farmers' social media utilization

Table 8 presents the results of the multiple linear regression analysis of the factors influencing smallholder farmers' social media usage. The test for multicollinearity among the variables used in the model

Table 7. Distribution of respondents based on the challenges experienced by farmers in their usage of social media in agriculture.

Challenges	Mean	Rank
Poor network coverage and internet connectivity	1.68	Tenth
High cost of internet facilities and data charges	2.48	Third
High cost of tools and connecting devices such as cell phone, laptop, tablet and so on	2.58	First
Inadequate social media awareness.	2.29	Seventh
High cost of maintenance	2.50	Second
Inadequate infrastructure to support use	2.43	Fourth
Lack of technical skills and capacity to use tools and apps.	2.38	Fifth
Inadequate exposure and training	2.37	Sixth
Inadequate authentication and accuracy of provided information and data on social media.	1.73	Eighth
Privacy concerns	1.72	Ninth

The mean score was derived as very severe (3), moderately severe (2) and not severe (1).

Source: Field Survey, 2022.

Table 8. Factors influencing smallholder farmer's social media usage.

Variables	Coeff	Std Err	T	$p > t$	VIF	Tolerance (1/vif)
Age	-0.1060775	0.020111	-5.27	0.000***	2.14	0.467389
Education	1.74993	0.2290535	7.64	0.000***	2.17	0.459785
Educated family member	-0.4351977	0.9128178	-0.48	0.634	1.07	0.935456
Farming experience	0.0384689	0.0386681	0.99	0.320	1.61	0.622811
Farm size	-0.2040383	0.1379533	-1.48	0.140	1.23	0.814307
Membership of cooperative/society	-1.162977	1.235729	-0.94	0.347	1.06	0.939210
Frequency of visit	0.4896393	0.2049815	2.39	0.017**	1.09	0.920221
Perceived benefit index	0.0704523	0.0278657	2.53	0.012***	5.25	0.190523
Perceived ease index	-0.0109061	0.0290887	-0.37	0.708	6.17	0.162179
Constraint index	-0.1052838	0.0333921	-3.15	0.002***	1.52	0.658182
Relationship status	0.496532	0.3990377	1.24	0.214	1.13	0.881141
Extension visit	0.0966526	0.9136888	0.11	0.916	1.07	0.933673
Secondary occupation	-0.7241158	0.4325875	-1.67	0.095*	1.29	0.774152
Constant	31.20591	2.504503	12.46	0.000	-	-
Mean VIF	-	-	-	-	2.06	-
F	42.40	-	-	-	-	-
Prob > F	0.0000	-	-	-	-	-
R-squared	0.5990	-	-	-	-	-
Adj R-squared	0.5849	-	-	-	-	-

Statistical significance *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Source: Authors computation from analyzed data, 2022.

was carried out as shown in Table 8 using the variance inflation factor (VIF). Multicollinearity was not a problem as the computed mean VIF value was 2.06, and the values of tolerance for the variables were also high. The F-test statistic value for the model was 42.40 with statistical significance at $p < 0.01$ and an adjusted R-squared value of 0.5848. This implies that the estimated model produced a good fit for the data and the parameters were not statistically jointly equal to zero. Six out of the 13 independent variables fitted into the model were established as significant factors that influenced smallholder farmers' social media usage. These significant determinants included age ($t = -5.27$; $p \leq 0.01$), educational qualification ($t = 7.64$, $p \leq 0.01$), frequency of visits to other locations ($t = 2.04$, $p \leq 0.05$), perceived benefit index ($t = 2.53$, $p \leq 0.01$), constraint index ($t = -3.15$, $p \leq 0.01$) and secondary occupation ($t = -1.67$, $p \leq 0.10$). This implies that all six variables significantly influenced respondents' usage of social media in the study area.

Discussion

Socioeconomic profile of smallholder farmers

The socioeconomic profiles of smallholder farmers have great potential to influence their innovation and technology (such as social media) utilization. The mean age of 57.5 years among the farmers suggests that most of them were still of working and productive age and thus are expected to be open to the use of social media platforms. However, with the majority of them being middle-aged and tending

towards their old age, their usage of social media may not be optimal as compared to the youth because older farmers tend to be less tech savvy. As opined by Afande and Uk (2015), farmers in the younger age bracket tend to be the largest users of social networks in terms of quantity and intensity. On the other hand, contrary to expectations, farming experience may have a detrimental impact on the adoption of social media in agriculture. This is because farmers with many years of experience may already have the systems and conventional procedures in place that they utilize and deem to be effective. Hence, they may be more reluctant to use social media for agricultural purposes and as a source of information because of their novelty. Interestingly, this notion is supported by Idu et al. (2021), who reported a significant negative relationship between farming experience and social media usage. This suggests that experienced farmers use social media less often than those with less farming experience. Furthermore, findings relating to farm size cultivated by farmers in the study area indicate that the majority of farmers are smallholder farmers owning small-based plots of land on which they grow subsistence crops and one or two cash crops (Food and Agriculture Organization (FAO), 2012). This study views educational attainment as a major factor that will most likely have a favorable influence on how farmers use social media. According to Montshwe (2006), individuals with formal education experience higher ease of using ICTs and social media platforms. The high level of educational attainment observed among the respondents, as shown in the findings, is expected to increase their level of innovativeness, information-seeking behavior, decision-making and understanding of social media platforms, thus improving their ease of using social media for agricultural purposes. Furthermore, farmers who have a formal education also have a higher likelihood of having a positive perception of social media and its importance in their agricultural production. Moreover, the presence of an educated family member in the household of most smallholder farmers provides an avenue for them to rely on receiving assistance from their educated family member/s in terms of navigation and usage of social media applications. Hence, the ease of using social media is expected to increase. As reported by Beaman et al. (2021), higher perceived ease of use leads to higher perceived usefulness, which ultimately increases the actual level of social media usage.

Moreover, the majority of smallholder farmers in the area indicated that they were members of farmer groups or cooperative societies. This means that among many things, these farmers value collaboration, social networks, and information-sharing forums, all of which can be enhanced using social media. According to Jack (2013), farmer groups/cooperatives may influence the adoption and use of technologies in agriculture in several ways. First, cooperatives can ease farmers' liquidity constraints by offering credit to their members. Second, by establishing social networks where agricultural information may be exchanged, such as WhatsApp groups, farmers will have an impact on the adoption and utilization of technologies. Additionally, the distribution of farmers according to their relationship status suggests that single people dominate agricultural production in the district. Quaye et al. (2021) found that the decision to adopt ICTs is adversely correlated with a household's marital status. Married households are less likely to adopt ICTs optimally, such as social media, than single individuals. This further implies that single farmers in the district are likely to have fewer family responsibility ties than married people; therefore, they are expected to have a higher probability of devoting part of their financial resources to adopting agricultural technologies, which they perceive as beneficial to their farm business. However, the study findings revealed that most smallholder farmers in the area do not have access to regular and timely information from the traditional extension framework. According to Kondylis et al. (2017), extension services and training programs often fail to reach farmers with appropriate and timely information. This inappropriate or ineffective information delivery may constrain farmers' decision-making processes and ultimately dampen their yields and profits. Thus, the use of quick interaction and networking tools such as social media is needed to bridge this gap. This is because the majority of farmers in the area derive most of their personal income from farming activities, which may increase their level of innovativeness to ensure that they leverage available opportunities and technologies such as social media to enhance their farm business to increase income (Jacqueline & Mubanga, 2020). Nonetheless, only 13% of respondents indicated that they regularly travel outside their locations. As a result of the farmer's lack of cosmopolitanism, this may suggest that farmers in the district lack exposure to current information and global trends, which could reduce their level of social media usage. According to Sassen (2002), cosmopolitan individuals tend to be more exposed, interested in trends and happenings outside their location, and thus more innovative and therefore adopt and use technology more than less cosmopolitan individuals do.

Social media utilization and purpose of use among smallholder farmers

The results clearly revealed that WhatsApp, Facebook and Twitter were the three most used social media platforms in the study area in order of mention. This indicates that the use of these three social media platforms is currently being explored by farmers in the area, and there is great potential for their usage to be upscaled with the provision of increased capacity building for farmers. The study findings are in line with Kimani et al. (2019), who in their study reported that WhatsApp and Facebook were among the most popular platforms among farmers in Kiambu County, Kenya. Furthermore, Suchiradipta and Saravanan (2016) observed that agricultural actors preferred Facebook, WhatsApp, Google+ and YouTube for networking, information search and transfer. Thus, the intensity of social media usage is related to social media preferences. This aligns with Frayne et al. (2010), who emphasized that farmers' fondness towards a social media application leads to frequent utilization of such platforms for both personal and commercial purposes. This implies that farmers tend to use social media platforms that they perceive as beneficial to their livelihoods. WhatsApp and Facebook were the most preferred and most used apps in this study, and the findings are consistent with those of other similar social studies (Suchiradipta & Saravanan, 2016; Kimani et al., 2019; Ifejika et al., 2019; Abuta et al., 2021).

The study findings on purpose of social media usage suggest that smallholder farmers in the area make use of social media platforms for personal use, sourcing and sharing agricultural-related information, connecting with clients, and receiving news updates and events, with WhatsApp and Facebook also being highlighted across board as the prominent tools used. These findings are consistent with Kimani et al. (2019), who reported that the major uses of social media among smallholder farmers in Kenya were connecting with friends and relatives, as well as finding out news and events and sourcing for general information through the applications. Furthermore, Ifejika et al. (2019) stated that farmers have become dependent on their smartphones and laptops to satisfy their agricultural information needs.

However, it is worth noting that the majority of farmers are still yet to leverage the potential benefits they can derive by using social media for facilitating linkages with extension agents and agricultural-related institutions, purchasing online farm-related goods and services, and for financial purposes, as fewer farmers only indicated that they use social media for these purposes. This is in disagreement with Barau and Afrad (2017), who stated that social media platforms are being used in agricultural extension service delivery worldwide and have proven to be a very useful tool in agricultural extension and rural advisory services. By contrast, the majority of smallholder farmers in the study area are yet to maximize the use of social media to engage with extension agents and other agricultural institutions relevant to farm enterprises. This shows that social media has not yet been fully integrated into the South African extension advisory system, as expected, to reach smallholder farmers in rural areas. The reason for this might be aligned with the opinion of Bhattacharjee and Raj (2016) that the main cause of the limited use of social media by field-level extensionists is the lack of expertise and competency among extension staff. Moreover, Inegbedion et al. (2020) indicated that mobile phones have significantly contributed to the empowerment of farmers in developing countries through digital marketing, especially in reaching markets in remote areas. Unfortunately, farmers in the district have not optimally taken advantage of the marketing aspect of social media in their farm businesses. There has been an improvement in social media usage by smallholder farmers in the areas mentioned above. The optimal utilization of social media by smallholder farmers is expected to greatly improve their access to vital and timely information, expand their opportunities, open marketing avenues beyond the farm gate, and increase farm income. This is in consonance with Guanah et al. (2023), who stated that social media remains one of the sources that farmers use to obtain information on the most suitable crops and farm practices in Bayelsa, Nigeria.

Perceived benefit and ease of social media utilization

The results on smallholders' perceived benefit of using social media platforms show that the vast majority of farmers view the usage of social media in agriculture as a tool that saves time, has broader coverage and can reach a large number of people at the same time as the traditional travel and visit method. Cornelisse et al. (2011) state that social media can improve the effectiveness of communication between farmers and other participants in the agricultural industry. This is a significant characteristic of

social media that can be tapped into to address issues such as reduced spatial coverage, which is one of the main constraints identified in the South African agricultural advisory system (Liebenberg, 2015). As expected, farmers in the district had a positive view of using social media as a source of agricultural information. Kimani et al. (2019) stated that the expense of accessing information has been cited as a major barrier to the adoption of agricultural advances, especially in undeveloped countries where traditional techniques of dissemination, such as travel and visitation, are a norm. This notion explains why farmers resort to using social media to access information and generally view it as effective. Similarly, Nwafor et al. (2020) found that smallholder farmers in South Africa (free state) had a favorable opinion on the use of ICT in sourcing agricultural information.

Furthermore, the study deemed it vital to analyze farmers' perceptions of the ease of delivery of agricultural products, the ability to network online with various stakeholders in the agricultural industry, enhanced agribusiness, marketability of goods, improved interaction with extension agents and cheap and easy accessibility. There was a widespread positive perception that the optimal use of social media for the above-mentioned functions will improve their farm business more than what is obtainable now. As stated by Nwachukwu et al. (2023), enhancing smallholder farmers' access to and use of technologies such as social media can go a long way to ensure sustainable agricultural production, which will, in turn, improve the rural livelihoods of farmers. Furthermore, farmers also have a good perception of the potential benefits of using social media when marketing, interacting with extension agents, and various agencies in the agricultural industry. Although, as previously indicated in the study, the level of use of social media for these purposes is not yet prominent in the study area, farmers are positively disposed to the potential benefits of using social media for these purposes and what it can offer them. This provides a good foundation for all relevant stakeholders in the area to intensify social media use for these purposes. Therefore, this study concludes that farmers generally have a positive perception of social media use in agriculture.

Moreover, smallholder farmers generally exhibited a high level of perception of the ease of using social media for personal and agricultural-related activities. This might be because, as indicated earlier in the study findings, the majority of smallholder farmers have been exposed to one form of formal education or the other. Hence, this high literacy level is expected to enhance students' ability to utilize social media apps. This agrees with Bogale & Shimelis (2009), who stated that farmers with a minimum primary education have the advantage of using social media than those with no formal education. Furthermore, as opined by Montshwe (2006), individuals with formal education exposure usually experience greater ease of using ICTs and social media platforms, which is expected to ultimately enhance their level of utilizing such technologies.

Challenges of social media utilization

The study findings indicated that issues relating to cost and expenses involved in the use of social media are a huge hindrance that smallholder farmers face in preventing their effective and optimal usage of social media for personal and agricultural-related purposes in the study area. The lack of affordability of ICT devices (phones, laptops and tablets) and data may be attributed to the fact that the majority of respondents were not involved in any form of secondary occupation and were only dependent on social grants and remittances as a means of augmenting the income they generated from their farming practices. Similarly, Singh et al. (2015) in their study discovered that the high cost of Internet services was a key barrier to small-scale farmers' usage of ICT platforms. Samarajiva (2010), also alluding to this fact, stated that mobile broadband subscription with a data allowance of 1.5GB or more costs four times more in the developing countries (including South Africa) than it does in developed nations. Furthermore, Umunnakwe et al. (2018) observed that the high cost of devices (66.7%) and limited income (64.4%) were major barriers faced by smallholder farmers in their use of social media. Another major constraint affecting farmers' usage of social media in agriculture is inadequate infrastructure to support use. This implies that farmers do not possess adequate infrastructure, such as fast Internet connections, to support effective and optimal social media usage. According to Seretse et al. (2018), small-scale farmers in rural areas lack access to computers, adequate telecommunications infrastructure and computer literacy to understand electronic information.

Lack of technical skills and capacity to use tools and apps was another major hindrance identified in the study area. This suggests that for the optimum usage of social media, educated farmers require technological training. Erickson (2011) stated that the optimal usage of social media by agricultural farmers requires formal developmental training. Social media awareness and use, especially for extension linkages and marketing, were also lacking in the district. This explains the lack of social media usage in core areas, such as marketing and facilitating linkages with the extension of personal and other agricultural institutions. Smallholder farmers in the area still require in-depth training and capacity building regarding the diversified potential benefits they can derive through social media usage that will be beneficial to their agricultural activities. Similarly, Kimani et al. (2019) found that a vast majority of farmers in the study area recorded some degree of familiarity with social media, but only a small proportion had a high understanding of maximizing its use for improved income and livelihoods. However, inadequate authentication and accuracy of the provided information and data on social media, privacy concerns, poor network coverage and Internet connectivity were pointed out as not severe constraints affecting the usage of social media in the study area. This implies that most farmers in the area perceive social media as a safe and reliable agribusiness tool. Moreover, the results suggest that Internet coverage is relatively good for a large part of the district. This notion is supported by Lavery et al. (2018), who stated that in South Africa, despite relatively high Internet coverage, most individuals cannot afford to go online because of high data costs.

Factors influencing smallholder farmers' social media utilization

The results on the socioeconomic factors influencing smallholder farmers' social media utilization revealed that the age of respondents was negatively and significantly ($p \leq 0.01$) related to the dependent variable. A negative coefficient (-0.1060775) indicates a negative relationship. This means that the higher the age of the farmers, the lower their use of social media in agricultural activities in the study area. This is expected because older farmers are usually said to be less innovative, and thus they might be hesitant and less interested in using social media, as they might want to stick to the traditional method of information-seeking, linkages and marketing to which they are used. This is in line with the assertion of Idu et al. (2021) that the propensity to utilize social media diminishes with increasing age. Furthermore, Katunyo et al. (2018) discovered an inverse association between age and the degree of use of ICT tools, suggesting that younger farmers are more open to new concepts and innovations than older ones.

The coefficient of the educational level (1.74993) of farmers was statistically significant at $p \leq 0.01$ and positively related to the social media utilization level of farmers. This implies that the higher the level of education, the more likely the farmer is to interact and use social media platforms for agricultural and other purposes. Smallholder farmers are more likely to know how to use social media technologies to gather and communicate agricultural information, as their level of education increases. This finding is consistent with Jiriko et al. (2015), who found that education has a positive relationship with one's capacity to use ICT tools and platforms. Additionally, the findings of this study concur with those of Fasina et al. (2022), who discovered that education was significant in the use of ICTs. In addition, Akinpelu et al. (2021) found that educational background influences ICT usage.

The parameter for frequency of visits to other locations (0.4896393) by the respondents was also significant ($p \leq 0.05$) and positively related to the usage of social media in agriculture. This implies that an increase in the level of cosmopolitanism among smallholder farmers will lead to an increase in their use of social media. This was expected because farmers who travelled frequently beyond their location were more exposed to new things and was more likely to be innovative. Additionally, cosmopolitan individuals tend to be more interested in global issues, diverse cultures and events worldwide. This is expected to translate into a higher rate of social media use. According to Rogers (2004), those with greater cosmopolitanism accept innovations earlier, are more knowledgeable, and are more influential. Findings by Hakken and Fluehr-Lobban (2003) also reiterate this notion that cosmopolitanism has an influence on farmers' awareness of their environment, and farmer awareness has a positively significant impact on the use of social media platforms (Kimani et al., 2019).

The coefficient of secondary occupation (-0.7241158) was negative and significant at $p \leq 0.10$. This shows an inverse relationship between secondary occupation and social media usage. This shows that

farmers with no or less lucrative secondary occupations are more likely to utilize social media platforms and adopt them in their farm businesses. This is true and has met the a priori expectations that farmers who lack substitute income sources and depend solely on their farm business are more likely to leverage available opportunities and technologies such as social media to enhance their farm business to increase income. This finding is in consonance with Voss et al. (2021), who reported a negative relationship between farmers with multiple sources of livelihood and the adoption and usage of social media. This was attributed to farmers' lack of time to invest in adopting new technologies. However, contrary to the findings of Leng et al. (2020), the empirical results of a study conducted in China showed that multiple income streams had a positive and significant impact on ICT adoption and usage, which was attributed to the increased affordability of ICT devices and data costs.

The results also indicate that the perceived benefit index coefficient (0.0704523) of respondents is positively and highly significant at $p \leq 0.01$. This shows a positive relationship, meaning that the higher the respondents' perceived benefit of social media in agriculture, the more likely they are to use social media in an agricultural context. Beltran et al. (2021) stated that many smallholder farmers perceived social media platforms as the easiest way to deliver the information and access the data they need to improve their farming skills; hence, there was high usage. Another recent study conducted by Daigle and Heiss (2021) indicated that the pursuit and use of social media platforms by US female farmers is facilitated by their perception and belief that social media provides important considerations for facilitating social networking and interaction among female farmers, and that it is a key strategy for women to overcome barriers to accessing resources and information in their field.

The respondents' constraint index (-0.1052838) was negative and significantly related to the dependent variable at $p \leq 0.01$ level of significance. This implies that the fewer the constraints that smallholder farmers experience in their usage of social media, the more likely they are to adopt and intensify their use. According to Atala and Umar (2006), the presence of various severe constraints, such as poor services, high charges, network problems and difficulty in interconnectivity, reduces the effective use of social media, and the opposite is also the case in which reduced levels of constraints increase social media usage. Abdullahi et al. (2021) also noticed an inverse relationship between constraints and mobile phone app usage, implying that farmers with more difficulties in using mobile apps experienced a decline in their usage of mobile phone apps.

Conclusion and recommendations

This study investigated social media utilization among smallholder farmers in South Africa, using the Mopani district of Limpopo Province as a case study. Overall, the findings generally reflect that although smallholder farmers in the area use social media for personal purposes, their usage of social media platforms remains low, especially for agricultural purposes. The majority of farmers are yet to leverage the potential benefits of using social media for agricultural information search, sharing, marketing, advertising and linkage with extension agents and other agricultural institutions. Key challenges limiting social media usage for agricultural-related purposes, as indicated by the farmers, were costs, lack of technical skills and capacity and inadequate exposure and training. The study recommends that the government ensure policies that subsidize the cost of social media usage are put in place to assist in the promotion of inclusive technology for smallholder farmers. In addition, extension organizations and other rural advisory service stakeholders should package capacity-building programs to educate farmers on maximizing the benefits of social media platforms for agricultural purposes. Moreover, peer learning among farmers through the existing farmer groups, many of which belong to, should be encouraged and facilitated where those competent in social media take the lead in educating their counterparts on how to maximize social media platforms in their agricultural enterprise. This will greatly improve their access to vital and timely information, resources and linkage with extension agencies, and expand opportunities for marketing their farm produce to more profitable outlets beyond the farm gate.

The novelty and contribution of this research is its ability to empirically point out the current usage of social media by smallholder farmers in agriculture. More importantly, the study was able to identify farmers' perceptions of the usefulness and ease of using social media in agriculture as well as the challenges experienced by farmers in their use of social media in the study area. The study also provides insights

into the factors influencing the usage of social media in agriculture. The new knowledge presented in this research serves as a foundation to support the integration of social media usage in agriculture to complement the traditional information networking, sourcing, sharing, and marketing strategies employed by smallholder farmers, extension and rural advisors in the study area and country. The study findings are useful in guiding policy formulation and implementation related to social media use among smallholder farmers and also provides knowledge and insight that can enhance future research debate on social media utilization among farmers. However, the study focused on the use of social media in agriculture with reference to smallholder farmers, specifically in Mopani district, Limpopo, South Africa, and it is limited by the assumption that the data elicited from the farmers were accurate and correct. Further studies can be undertaken to target a different location or a particular area of social media use, such as the role of social media in influencing the profitability of smallholder farmers. Moreover, research could be undertaken to empirically assess the viability of social media as an extension advisory tool.

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Author's contribution statement

M.A.I. and O.D.O. were involved in the conception and design; M.A.I., O.D.O. and A.A.I. were involved in the investigation, methodology, data analysis, and interpretation; M.A.I. wrote the original draft; O.D.O. and A.A.I. were involved in review, editing, and article revision for intellectual content. All authors have read and approved the final version of the manuscript for publication and are accountable for all aspects of this research.

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Data availability statement

All data analyzed during this study have been included within the article, and other raw data that support the study findings are available from the corresponding author, O.D.O., upon reasonable request.

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